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Our Reference: SXS-100-B   PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Mark W. Lehnert & Paul Podsobinski
Serial Number:	10/658,301
Filing Date:	September 9, 2003
Examiner/Art Group Unit:	Chukwurah, Nathaniel C./3721
Title:	CONTROL SYSTEM FOR DISCONTINUOUS POWER DRIVE

CERTIFICATE OF MAILING AND TRANSMITTAL LETTER

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted with this document is the Postcard and Revised Appeal Brief in the above-identified application.

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REMARKS

Applicant's attorney notes that section 1205.03 of the MPEP provides for and instructs that an examiner should not require a corrected brief for minor non-compliance in an appeal brief, for example, if the evidence appendix and/or related proceedings appendix are missing, but the record is clear that there is no evidence submitted and/or no related proceedings listed in the related appeals and interference section.

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Title: CONTROL SYSTEM FOR DISCONTINUOUS
                                    POWER DRIVE

REVISED APPEAL BRIEF

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Please enter the following Appeal Brief in the appeal filed February 16, 2006.

REAL PARTY IN INTEREST

The real party in interest is SigmaSIX LLC having a principal place of business at 2144 Avon Industrial Drive, Rochester Hills, Michigan 48309.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

STATUS OF CLAIMS

Claims 1-12, 14, 16-28, 30, 32-39, and 41-48 stand rejected. Claims 15, 31, and 40 stand allowable over the prior art of record. Claims 13 and 29 have been canceled.

STATUS OF AMENDMENTS

No after final amendments have been filed.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention claims an apparatus for controlling an impact/pulse tool tightening cycle. As recited in claim 1 the apparatus includes an inlet port for receiving a supply (10) of pressurized fluid and a fluid pressure regulator (18) for maintaining a selectable pressure value to be delivered to the tool (22) to be controlled. (¶[0017], ll. 2-9; Fig. 1) The apparatus also includes a sensor (20) for measuring a characteristic corresponding to the flow of the fluid to the tool (22) to be controlled and for generating an output signal. (¶[0017], ll. 7-10; Fig. 1) A central processing unit (26) receives the output signal from the sensor (20) and validates a fastener tightening cycle process based solely on a monitored signature of fluid flow versus time in accordance with a program stored in memory to control flow of fluid to the tool (22) to be controlled. (¶[0007], ll. 5-10; ¶[0008], ll. 14-20; ¶[0017], ll. 10-17; ¶[0018], ll. 8-14; ¶[0025], ll. 12-16 and 28-41; Figs. 1-6)

The program of claim 1, as recited in dependant claim 2, includes a setup process for each fastener tightening cycle to be learned. (¶[0019]; Fig. 2) As recited in claim 3, the setup process of claim 2 includes a transducer (32) connectible between the tool (22) to be controlled and the fastener (30) to be tightened for generating a torque signal during a ramped pressure fastener tightening cycle. (¶[0017], ll. 11-16; Figs. 1-5) As part of the setup process, the central processing unit (26) receives the torque signal from the transducer (32) during the ramped pressure fastener tightening cycle and sets a fixed pressure value based on the torque value input. (¶[0019], ll. 4-5; ¶[0025], ll. 13-16; Figs. 2-5) As recited in claim 4, as part of the setup process in claim 2, the central processing unit (26) receives a torque value input by an operator using a manual torque wrench during a preset pressure fastener tightening cycle. The central processing unit (26) also sets a fixed pressure value based on the torque value input. (¶[0019], ll. 4-5; ¶[0025], ll. 23-28; Figs. 2-5)

As recited in claim 5, the setup process of claim 2 includes a transducer (32) connectible between the tool (22) to be controlled and the fastener (30) to be tightened for generating a torque signal during the fastener tightening cycle at a fixed pressure. (¶[0017], ll. 16-22; Figs. 1-5) The central processing unit (26) receives the

torque signal from the transducer (32) during the fastener tightening cycle at a fixed pressure value. (¶[0019], ll. 4-5; ¶[0025], ll. 13-16; Figs. 2-5) Based on the output signal received from the sensor (20) and the received torque signal, the central processing unit (26) sets a fluid flow signature. (¶¶[0019]-[0020]; ¶[0026], ll.22-33) During the setup process of claim 2 the central processing unit (26) receives the output signal from the sensor (20) during a free run process and sets a threshold value based on the received output as recited in claim 6. (¶[0027], ll. 9-43) The invention recited in claim 7 includes the setup process of claim 2 where the central processing unit (26) receives the output signal from the sensor (20) during a tightened fastener rehit cycle and sets a threshold value based on the received output. (¶[0021]; ¶[0027], ll. 9-43)

The setup process recited in claim 2 includes a control program for each fastener tightening cycle to be preformed as recited in claim 8. Claim 9, which includes by dependency the setup process of claim 8, recites that the central processing unit (26) receives the output signal from the sensor (20) during the fastener tightening cycle and compares the output signal with bench marks stored in memory based a previous fluid flow signature of an acceptable fastener tightening cycle for controlling the fluid flow to the tool (22) to be controlled. (¶[0007], ll. 5-10; ¶¶[0019]-[0020]; Figs. 2-5)

As recited in claim 10, the program of claim 1, includes an error proofing program for each fastener tightening cycle to be performed. (¶[0024]; ¶[0025], ll. 28-41) As recited in the claim 11, the central processing unit (26) receives the output signal from the sensor (20) during the tightening cycle and compares the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle for generating error proofing signals from the fastener tightening cycle based on the received output signal as part of the error proofing program of claim 10. (¶[0007], ll. 5-10; ¶¶ [0019]-[0020]; ¶[0025], ll. 28-41; ¶[0027], ll. 9-43; Figs. 2-5)

The apparatus of claim 1 includes a transducer (32) as recited in claim 16. The transducer (32) is connectible between the tool (22) to be controlled and the

fastener (30) to be tightened and operably connectible to the central processing unit

(26) for running a setup process for a fastener tightening cycle to be learned.

(¶[0017], ll. 16-22; Figs. 1-5)

As recited in claim 42, the central processing unit (26) of claim 1

determines whether a fastener tightening cycle process is one of a valid process cycle

and an invalid process cycle. (¶[0019]; Figs. 2-5) If an invalid process cycle occurs,

as recited in claim 43, the central processing unit (26) determines whether the

fastener tightening cycle process is invalid as a result of one of a rehit fastener cycle,

a slipping fastener cycle, and an early trigger release fastener cycle. (¶¶[0019]-

[0021]; Figs. 2-5)

As recited in claim 33, the apparatus for controlling an impact/impulse

tool (22) during a fastener tightening cycle includes a port connectible to a supply

(10) of pressure regulated fluid and a sensor (20) for sensing a characteristic

corresponding to the flow of fluid to the tool (22) to be controlled and for generating

an output signal. (¶[0017], ll. 2-10; Fig. 1) The apparatus also includes a central

processing unit (26) for processing the received output signal from the sensor (20) to

validate a fastener tightening cycle process and for controlling the flow of fluid to the

tool (22) to be controlled without reference to an actual amount of torque applied to

the fastener. (¶[0017], ll. 10-17; ¶[0018], ll. 8-14; ¶[0025], ll. 12-16 and 28-41;

¶[0026], ll. 22-33; Fig. 1) As recited in claim 47, which depends from claim 33, the

central processing unit (26) validates a fastener cycle process based solely on a

monitored signature of fluid flow versus time. (¶[0019]-[0021]; Figs. 2-5)

As recited in independent claim 34, the apparatus for controlling an

impact/impulse tool (22) during a fastener tightening cycle includes a port

connectible to a supply (10) of pressurized fluid regulated to a constant pressure.

(¶[0017], ll. 2-9) The apparatus also includes means for monitoring a characteristic

corresponding to the flow of fluid to the tool (22) to be controlled at the regulated

constant fluid pressure and means for analyzing the monitored characteristic to

determine fastener tightening cycle process validity without reference to an actual

amount of torque applied to the fastener. (¶¶[0007]-[0008]; ¶¶[0019]-[0021];

¶[0025], ll. 12-16 and 28-41; ¶[0026], ll. 22-33; ¶[0027], ll. 1-3 and 9-18; Figs. 1-6)

As recited in dependent claim 35, the processing means includes means for comparing the monitored characteristic as a monitored fluid flow signature versus time to an acceptable fluid flow signature versus time. (¶¶[0020]-[0021]; ¶[0025], ll. 12-16 and 28-41; ¶[0026], ll. 22-33; ¶[0027], ll. 1-3 and 9-43; Figs. 3-6) As recited in claim 48, the analyzing means in claim 34, determines fastener cycle process validity based solely on a monitored signature of fluid flow versus time. (¶¶[0019]-[0021]; Figs. 2-5)

The apparatus for controlling an impact/impulse tool (22) during a fastener tightening cycle, where the tool (22) is connectible to a supply (10) of fluid regulated as a constant pressure as recited in claim 37 includes means for monitoring a characteristic corresponding to a fluid flow signature over a predetermined period of time for fluid supplied to the tool to be controlled. (¶[0017], ll. 2-9; ¶¶[0019]-[0021]; ¶[0025], ll. 12-16 and 28-41; Figs. 1-6) The apparatus also includes means for determining tool process validity based solely on the monitored fluid flow signature versus time. (See claim 37; ¶¶[0020]-[0021]; ¶[0025], ll. 12-16 and 28-41; ¶[0026], ll. 22-33; ¶[0027], ll. 1-3 and 9-43; Figs. 3-6) As recited in dependent claim 38, the determining means includes means for comparing the monitored fluid flow signature versus time to an acceptable fluid flow signature versus time to determine tool process validity. (¶¶[0007] ll. 8-10; ¶¶[0020]-[0021]; ¶[0025], ll. 12-16 and 28-41; ¶[0026], ll. 22-27; ¶[0027], ll. 1-3 and 9-44; Figs. 3-6)

The present invention also claims a method for controlling an impact/pulse tool (22) during a fastener tightening cycle. (¶[0017], ll. 2-9) The method as recited in claim 17 includes the steps of receiving a supply (10) of pressurized fluid through an inlet port, maintaining a selectable pressure value to be delivered to the tool (22) to be controlled with a fluid pressure regulator (18), and measuring a characteristic corresponding to the flow of the fluid to the tool (22) to be controlled with a sensor (20) and generating an output signal. (¶[0017], ll. 2-10) The method also includes the step of receiving the output signal from the sensor (20) with a central processing unit (26) and validating a fastener tightening cycle process

based solely on a monitored signature of fluid flow versus time in accordance with a program stored in memory to control flow of fluid to the tool to be controlled. (¶[0007] ll. 5-10; ¶[0008] ll. 14-20; ¶[0017]; ¶[0018], ll. 8-14; ¶[0025], ll. 12-16 and 28-41; Fig. 1-6)

The method of claim 17 includes the step of running a setup process for each fastener cycle to be learned as recited in claim 18. (¶[0019]; Fig. 2) The setup process of claim 18 includes the steps of connecting a transducer (32) between the tool (22) to be controlled and the fastener to be tightened, generating a torque signal during a ramped pressure fastener (30) tightening cycle, receiving the torque signal from the transducer (32) with the central processing unit (26) during the ramped pressure fastener tightening cycle, and setting a fixed pressure value based on the received torque signal. (¶[0017], ll. 16-22; Figs 1-5) As recited in claim 20, the setup process of claim 18 includes the steps of receiving a torque value input by an operator using a manual wrench with the central processing unit (26) during a preset pressure fastener tightening cycle and setting a fixed pressure value based on the torque value input. (¶[0019], ll. 4-5; ¶[0025], ll. 13-16; Figs. 2-5) As recited in claim 21, the setup process of claim 18 includes the steps of connecting a transducer (32) between the tool (22) to be controlled and the fastener (30) to be tightened, generating a torque signal during the fastener tightening cycle at a fixed pressure value, receiving the torque signal from the transducer (32) with the central processing unit (26) during the fastener tightening cycle at a fixed pressure value, and setting the fluid flow signature based on the output signal received from the sensor and the received torque signal. (¶[0017], ll. 16-22; Figs. 1-5) As recited in claim 22, the setup process of claim 18 includes the steps of receiving the output signal from the sensor (20) during a free air run process with the central processing unit (26) and setting a threshold value based on the received output signal. (¶[0027], ll. 9-43) As recited in claim 23, the setup process of claim 18 includes the steps of receiving the output signal from the sensor (20) during a tightened fastener rehit cycle with the central processing unit (26) and setting a threshold value based on the received output signal. (¶[0021]; ¶[0027], ll. 9-43; Figs. 2-5)

As recited in claim 24, the setup process of claim 18, includes the step of running a control program for each fastener tightening cycle to be performed. The control program of claim 24 includes the steps of receiving the output signal from the sensor (20) during fastener tightening cycle with the central processing unit (26), comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle, and controlling fluid flow to the tool (22) to be controlled based on the results of the comparing step. (¶[0007], ll. 5-10; ¶¶[0019]-[0020]; Figs. 2-5)

The method of claim 17 includes the step of running an error proofing program for each fastener tightening cycle to be performed according to claim 26. (¶[0024]; ¶[0025] ll. 28-41) As recited in claim 27, the error proofing program of claim 26 includes the steps of receiving the output signal from the sensor (20) during the fastener tightening cycle with the central processing unit (26), comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle, and generating error proofing signals for the fastener tightening cycle based on the received output signal. (¶[0007], ll. 5-10; ¶¶[0019]-[0020]; ¶[0025], ll. 28-41; ¶[0027], ll. 9-43; Figs. 2-5)

The method of claim 17 includes the steps of operably connecting a transducer (32) between the tool (22) to be controlled and the fastener (30) to be tightened and operably connecting a torque signal from the transducer (32) to the central processing unit (26) for running a setup process for a fastener tightening cycle to be learned as recited in claim 32. (¶[0017], ll. 16-22; Figs. 1-5)

As recited in claim 45, the central processing unit (26) determining step of claim 17 includes the step of determining whether a fastener tightening cycle process is one of a valid process cycle or an invalid process cycle. (¶[0019]; Figs. 2-5) If an invalid process cycle occurs, as recited in claim 46, during the central processing unit (26) determining step of claim 45 the central processing unit (26) determines whether the fastener tightening cycle process is invalid as a result of one of a rehit fastener cycle, a slipping/stripping fastener cycle, and an early trigger release fastener cycle. (¶[0021]; ¶[0027]; ll. 9-43; Figs. 2-5)

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Issue 1: Are claims 1, 12, 14, 17, 28, 30, 33-39, 41-42, 44-45, and 47-48 patentable under 35 U.S.C.§103(a) over McKendrick (U.S. Pat. No. 4,644,848) in view of Tambini et al (U.S. Pat. No. 5,592,396)?

> Appellant Answers: Yes

> Examiner Answers: No

Issue 2: Are claims 2, 4, 6, 7-9, 18, 20, 22-25, 43 and 46 patentable under 35 U.S.C. .§103(a) over McKendrick in view of Tambini et al. as applied to claims 1 and 17 and further in view of Lysaght (U.S. Pat. No. 6,055,484)?

> Appellant Answers: Yes

> Examiner Answers: No

Issue 3: Are claims 3, 5, 16, 19, 21, and 32 patentable under 35 U.S.C. .§103(a) over McKendrick in view of Tambini et al. and Lysaght, and further in view of Whitehouse (U.S. Pat. No. 5,315,501)?

> Appellant Answers: Yes

> Examiner Answers: No

Issue 4: Are claims 10, 11, 26, and 27 patentable under 35 U.S.C. .§103(a) over McKendrick in view of Tambini et al., and further in view of Bickford et al. (U.S. Pat. No. 4,864,903)?

> Appellant Answers: Yes

> Examiner Answers: No

ARGUMENT

Issue 1 - §103(a) McKendrick in view of Tambini et al

Claims 1, 12, 14, 17, 28, 30, 33-39, 41-42, 44-45, and 47-48 stand rejected under 35 U.S.C.§103(a) as being unpatentable over McKendrick (U.S. Pat. No. 4,644,848) in view of Tambini et al (U.S. Pat. No. 5,592,396). The Examiner asserts that it would have been obvious to one skilled in the art to provide the

apparatus of McKendrick with a sensor for measuring differential pressure in order to indicate when the condition of an impact tool changes.

It is submitted that the cited references, taken singularly or in any permissible combination, do not anticipate, teach or suggest the invention as recited in the claims of the present invention. In particular, the claims of the present application recite, in part, that pressurized fluid is supplied through a pressure regulator to maintain a selected pressure value to be delivered to the tool to be controlled (i.e. constant fluid pressure), the central processing unit validates a fastener tightening cycle process based solely on comparing a monitored signature of fluid flow versus time (at a constant fluid pressure) as recited in independent claims 1, 17, 34, 37 and dependent claims 47,48, and/or without reference to an actual amount of torque applied to the fastener as recited in independent claims 33, 34.

In contrast, the McKendrick reference discloses an electro-pneumatic pressure regulator for adjusting fluid pressure applied to a tool (i.e. an automatic adjustable pressure regulator), which is completely different from monitoring the flow of fluid to a tool to be controlled with the fluid supplied at a regulated constant fluid pressure. The "sensor" 42 referenced by the Examiner in McKendrick is a pressure to current transducer that generates a current signal through conductor 50 to a display/recorder device 52 so that the pressure of fluid supplied to the tool can be visually indicated or recorded during operation of the tool 14. ('848: col. 4, ll. 7-11). Contrary to the Examiner's assertion, the McKendrick reference fails to teach or suggest a sensor for generating an output signal to a central processing unit for validating a fastener tightening cycle based solely on a monitored signature of fluid flow at a constant fluid pressure versus time. At best, the McKendrick reference teaches providing an adjustable fluid pressure to a tool, and does not control stopping operation of the tool, or validation a tool fastener tightening process. McKendrick merely monitors the pressure applied to the tool 14 by the pressure-to-current transducer 42 and the display/recorder 52 for indicating the actual pressure being applied to the tool 14 to ensure that the tool operates only under specific working conditions. ('848: col. 4, ll. 50-59). Valve 79 in McKendrick connects the output

fluid pressure with the pneumatic cylinder 80 only when the output pressure is
stabilized at a desired value. ('848: col. 2, ll. 32-41; col. 5, ll. 38-40; col. 7, ll. 54-57)
The McKendrick reference does not anticipate, teach or suggest what level of
constant pressure should be provided to a tool, and/or how to validate a tool process
based solely on a monitored fluid flow signature at a constant fluid pressure versus
time, and/or how to control the tool based solely on a monitored fluid flow signature
at a constant fluid pressure versus time as recited in the pending claims.

The addition of the Tambini et al reference fails to overcome the
deficiencies of the McKendrick reference. The Examiner asserts that it would have
been obvious to one skilled in the art to provide the apparatus of McKendrick with a
sensor for measuring differential pressure in order to indicate when the condition of
an impact tool changes ('396: col. 6, l. 3) The Tambini et al. reference discloses a
torque monitoring system 20 for a fluid driven nutrunner tool 30. ('396: col. 5, ll.3-5).
The system includes a fluid flow meter 36 mounted in the fluid line to the tool 30.
('396: col. 5, ll. 29-30). The fluid flow meter 36 includes a transducer 48 feeding an
electrical signal to a data collection computer 52. ('396: col. 5, ll. 31-50; col. 6, ll. 11-
14). The purpose of the computer 52 is to acquire the signal, process it and derive
critical parameters according to predetermined algorithms, to compare this derived
data with predetermined limits and to format the data for transfer to other computing
devices 56 for storage, and to do further statistical processing of the derived
parameters. ('396: col. 6, l. 65 – col. 7, l. 3). It may also control interface device 51
to alert the operator as to the tightening status. ('396: col. 7, ll. 4-5). Data collection
computer 52 also optionally outputs to a stop valve 58, which is used to control the
torque applied by the tool by shutting off the fluid at the desired point. To use fluid
flow as a control parameter in a nutrunner tool, i.e., to control the torque applied by
the tool, as well as measure it, requires that the shut-off valve 58 be of the fast acting
type. ('396: col. 7, ll. 40-46). Therefore, Tambini et al. teaches providing fluid
pressure to the tool at a level higher than necessary to achieve the desired torque. In
other words, in Tambini et al, the tool could over-torque the fastener due to the
unregulated or excessive fluid pressure applied to the tool.

This is a significant deviation from the claimed invention for controlling an impact/pulse tool which sets a constant fluid pressure to control the maximum torque applied to the fastener , and which controls fluid flow to shutdown the tool when it has reached a fastener tightening cycle with an acceptable monitored fluid flow signature at constant fluid pressure versus time. Even if the automatic adjustable pressure regulator of McKendrick were used in combination with the Tambini et al reference fluid flow sensor, the pressure would be regulated to a level higher than necessary to achieve the desired torque according to the disclosure of Tambini et al., since there is no teaching or suggestion to the contrary in either of the cited references. Furthermore, there is no teaching or suggestion of how the McKendrick reference would be modified to use the fluid flow signal from the Tambini et al. reference, since the McKendrick reference teaches controlling pressure with a pressure sensor and the Tambini et al. reference teaches controlling torque with a fluid flow sensor. Neither reference teaches or suggests using a fluid flow sensor to control shut down of a tool based solely on a monitored fluid flow signature at a constant fluid pressure versus time. Accordingly, the asserted combination of references fails to teach or suggest a central processing unit receiving a fluid flow signal from a sensor for validating a fastener tightening cycle process based solely on a monitored signature of fluid flow (at a maintained constant fluid pressure) versus time and to control shut off of fluid flow to the tool. In other words, McKendrick and Tambini et al, taken singularly or in combination, fail to teach or suggest the claimed invention of process validation based solely on a monitored fluid flow signature (at a maintained constant fluid pressure) versus time, and/or without reference to an actual amount of torque applied to the fastener, and/or control of fluid flow to the tool based solely on the monitored fluid flow characteristic signature (at a maintained constant fluid pressure) versus time as set forth in claims 1, 17, 33-35, and 47-48.

As set forth in the attached Declaration under 37 C.F.R. §1.132 of Mark W. Lehnert, the Tambini et al reference (hereinafter '396) discloses the use of airflow to map the fastening event ('396: Fig. 4) using an apparatus similar to the

present invention. However, the device of the '396 reference does not use the map of the fastening event to control fluid flow to the tool, but rather uses the map as a trigger signal to start counting either the onset of a snug point or the proper starting point based on attaining a sufficient amplitude of pulses from an impact type power tool. In an impact wrench, the pulsed nature of the flow signal during the tightening or hammering, allows the blows or impacts to be easily counted for monitoring or control purposes. The '396 patent discloses, determining whether the minimum and maximum rates of change of the fluid flow rate during tightening are within predetermined values and then, statistically processes the parameter computed during subsequent tightenings to identify trends or deviations from the normal conditions, and in order to notify an operator of such trends or deviations.

This again is a significant deviation from the claimed invention, since the Tambini et al reference teaches counting impacts and calculation of algorithms related to torque parameters to infer a calculated torque value to be used in validating the fastener tightening process and in determining control of the tool. The claimed invention validates and controls the tool based solely on a monitored fluid flow signature at a constant fluid pressure versus time as recited in the pending claims.

The process for setting up the '396 system requires significant operator input and decision-making or, in the alternative, a considerable amount of data collection is required for the computer to properly develop the limits through calculations. A series of "normal" tightenings, preferably at least 25, may be performed and the results recorded manually or transferred automatically to the computer 56 (or computer 52). By statistically evaluating these results in computer 56 (or computer 52), useful limits may then be set in computer 52. These limits may then be used for trapping (identifying) trends or deviations from learned normal conditions.

This is a significant deviation both in process and in intent from the present invention. The present invention uses only one normal tightening cycle (LEARN Curve) to become fully set-up and functional.

The '396 patent describes the use of the device with direct drive (geared continuously driven) tools, while the disclosure for controlling a pulse/impact type tool is for a control method that counts the number of pulses (once the amplitude level exceeds a predetermined level) to start counting and controlling the number the pulses and then calculating the area under each pulse to determine the total energy of the controlled number of pulses via a mathematically derived equivalent torque value. Means is provided for electrically processing the signal to count the number of blows delivered by the wrench. Means is provided to shut-off the fluid supply to the tool when a predetermined number of blows have been delivered, and means is provided for displaying the number of blows counted. An attempt to qualifying the event is claimed to be accomplished by mathematically comparing the summation of the total area represented by the pulses to preprogrammed high and low torque limits to determine acceptance based on the torque limits.

Additionally, disclosure in the '396 patent is made that provides for trending and alarming the operator of trending based on the last two displayed fastening cycles. Extensive use of the flow signal gradient is disclosed in the '396 patent to determine such information as joint rate, joint configuration, lubrication and other varying conditions on which the system will report in an attempt to provide an indication of error detection.

In the preferred embodiment of the '396 patent a number of parameters are derived to help select the appropriate portion of the flow time curve over which to measure the flow gradient during the active phase of the tightening process. These levels are expressed as a percentage of the previously described mean speed level. The mean gradient is measured between the two points.

This is a significant departure from the use of the flow/time relationship as employed in the present invention. The present invention is based on reaching equilibrium in the threaded fastener/joint/tool system at the desired torque level. The present invention is one of a prescribed process whereby the operator uses a closed loop control method including a rotary torque transducer to automatically teach (LEARN TgTq) the system the proper pressure setting for the individual tool

being used through a gradual and controlled ramping of the air pressure while monitoring the applied torque to reach a condition of equilibrium in the tool/joint at the desired torque level. An actual run-down is then performed on the application (LEARN Curve) using the rotary torque transducer to determine the requisite run time required to attain equilibrium in the joint/tool system. This step is performed at the controlled pressure level as determined in the previous step and is controlled/determined by monitoring the signal from the transducer and stopping the airflow via a closed loop system. The actual control during the normal run cycle is by monitoring the flow drop off until it levels off (knee-over) and then timing the delivery of the controlled air pressure as predetermined in the Learn Curve step of the set-up routine to attain a condition of equilibrium in the system.

The present invention does not count the blows or pulses for control nor does the present invention attempt to calculate and display the torque from the data collected during these pulses. The present invention does not provide any information regarding torque applied by the tool and in fact the "impacts" are filtered out of the signal in the present invention. The present invention is directed to process control, rather than torque control as disclosed in the '396 patent reference.

The '396 patent reference attempts to correlate counting impacts and calculating area (energy) under the curve to the amount of torque applied to the fastener. Ultimately, this correlation proved impossible to accomplish in a commercial product, and no devices were ever commercially sold based on the '396 patent.

The McKendrick and Tambini et al references, taken singularly or in any permissible combination with each other, fail to anticipate, teach or suggest validating a fastener tightening cycle process based solely on a monitored fluid flow signature at a maintained constant fluid pressure versus time and/or without reference to an actual amount of torque applied to the fastener as more specifically recited in pending claims 1, 17, 33-35, and 47-48. Reversal of the Examiner's rejection is requested.

Issue 2 - §103(a) McKendrick in view of Tambini et al and Lysaght

Claims 2, 4, 6, 7-9, 18, 20, 22-25, 43 and 46 stand rejected under 35 U.S. C. §103(a) as being unpatentable over McKendrick (U.S. Pat. No. 4,644,848) in view of Tambini et al (U.S. Pat. No. 5,592,396) as applied to claims 1 and 17 above, and further in view of Lysaght (U.S. Pat. No. 6,055,484). The Examiner asserts that it would have been obvious to one skilled in the art to provide the apparatus of McKendrick with setup process for each fastener tightening cycle to be learned.

It is submitted that the addition of the Lysaght reference to the combination of McKendrick in view of Tambini et al does not overcome the deficiencies of the McKendrick and Tambini et al references for the reasons stated in detail above as if restated here in their entirety. The Lysaght reference discloses a device that monitors either the pressure of an air tool, the current of an electric tool, or the torque of a mechanical wrench to determine if the tool shut off at a target torque. The Lysaght reference does not teach monitoring fluid flow, or a setup process associated with monitoring fluid flow. The setup process disclosed in Lysaght is summarized as configuring the microprocessor to identify and store the parameter of a first period of time for the air pressure to attain a first predetermined range, and configuring the microprocessor to identify and store a second period of time for the air pressure to attain a second predetermined range. ('484: col. 2, ll. 6-11). This does not teach or suggest the particular setup according to the present invention as recited in pending claims 2, 4, 6, 7-9, 18, 20, 22-25, 43, and 46. The Lysaght reference taken singularly or in any permissible combination with McKendrick and/or Tambini et al,, fails to anticipate, teach or suggest validating a fastener tightening cycle process based solely on a monitored fluid flow signature at a maintained constant fluid pressure versus time, and/or setting a fixed pressure value based on a manual torque wench reading input by an operator and/or setting a threshold value based on a fluid flow signal during a tightened fastener rehit cycle, and/or setting a threshold value based on a fluid flow output signal during a free air run process, and/or comparing a fluid flow signature during a fastener tightening cycle with an acceptable fluid flow signature for controlling fluid flow to the tool as

more specifically recited in pending claims 2, 4, 6, 7-9, 20, 22-25, 43 and 46. None
of the cited reference teaches or suggests a validation process and tool control based
solely on a monitored fluid flow signature at a maintained constant fluid pressure
versus time. The McKendrick reference teaches adjustable pressure regulation
without controlling shutdown of the tool, the Tambini et al reference teaches torque
based monitoring and control of the tool torque, and the Lysaght reference teaches
monitoring pressure, current, or torque to determine if the tool shut off at the desired
torque. Only the present application teaches monitoring and control based solely on
a fluid flow signature at a constant pressure versus time to control shutdown of the
tool and to validate the fastener tightening process. Reversal of the Examiner's
rejection is requested.

Issue 3- §103(a) McKendrick in view of Tambini et al, Lysaght, and Whitehouse

Claims 3, 5, 16, 19, 21, and 32 stand rejected under 35 U.S.C. §103(a)
as being unpatentable over McKendrick (U.S. Pat. No. 4,644,848) in view of
Tambini et al (U.S. Pat. No. 5,592,396) and Lysaght (U.S. Pat. No. 6,055,484), and
further in view of Whitehouse (U.S. Pat. No. 5,315,501). The Examiner asserts that
it would have been obvious to someone skilled in the art at the time of the invention
to provide the apparatus of McKendrick with a transducer connectible between the
tool and the fastener as taught by Whitehouse in order to provide the same benefit as
discussed in Whitehouse.

It is submitted that the addition of the Whitehouse reference to the
combination of McKendrick in view of Tambini et al and Lysaght does not overcome
the deficiencies of the McKendrick, Tambini et al, and Lysaght references for the
reasons stated in detail above as if restated here in their entirety. The Whitehouse
reference discloses a torque overshoot compensator, where the torque overshoot is
determined and the torque set point is adjusted to compensate for the torque
overshoot. During subsequent fastening jobs, the deceleration time is measured
between the same selected fractional values of target torque, the overshoot is
calculated from the expression $Y=K/X$, where Y is overshoot, X is the deceleration
time required to tighten the fastener, and K is a constant determined using the

measured deceleration time and torque overshoot during a previous high torque rate job in the foregoing expression. The measurements and calculations are performed job-to-job developing a running average of the constant K. Therefore, the torque transducer 32 is required for each fastener tightening cycle, not just for setup as claimed in the pending claims of the present application.

The Whitehouse reference taken singularly or in any permissible combination with McKendrick and/or Tambini et al. and/or Lysaght, fails to anticipate, teach or suggest validating a fastener tightening cycle process based solely on a monitored fluid flow signature versus time and/or without reference to an actual amount of torque applied to the fastener as more specifically recited in the pending claims. The Whitehouse reference taken singularly, or in any permissible combination, does not teach or suggest setting a fixed pressure value based on a torque signal generated during a ramped pressure fastener tightening cycle, and/or setting a fluid flow signature based on a torque signal during a tightening cycle at a fixed pressure value as recited in claims 3, 5, 16, 19, 21, and 32. Reversal of the Examiner's rejection is requested.

Issue 4 - §103(a) McKendrick in view of Tambini et al and Bickford

Claims 10, 11, 26, and 27 stand rejected under 35 U.S. C. §103(a) as being unpatentable over McKendrick (U.S. Pat. No. 4,644,848) in view of Tambini et al (U.S. Pat. No. 5,592,396) and further in view of Bickford et al (U.S. Pat. No. 4,864,903). The Examiner asserts that it would have been obvious to one skilled in the art to provide the modified program of McKendrick with an error proofing program for each fastener tightening cycle in order to obtain the significant advantages of faster operation of the wrench, eliminate or reduce operator error, more reliable and accurate operation of the wrench to impose the desired torque on the fastening element, and ability to obtain a documented history of the tightening of the fastener.

It is submitted that the addition of the Bickford reference to the combination of McKendrick in view of Tambini et al does not overcome the deficiencies of the McKendrick and Tambini et al references for the reasons stated in

detail above as if restated here in their entirety. The Bickford et al reference
discloses converting the operating pressure of the wrench, after compensation for the
temperature of the pressure transducer, to a torque measurement and displaying a
digital readout of the torque value. Therefore, none of the cited references teaches
monitoring, validation, or control of the tool process based solely on fluid flow. The
McKendrick reference teaches monitoring pressure, while the Tambini et al. and
Bickford references teach monitoring torque. The Bickford reference taken
singularly, or in any permissible combination, fails to teach or suggest error proofing
a fastener tightening cycle based solely on a monitored fluid flow signature at a
constant fluid pressure versus time as recited in claims 10, 11, 26, and 27. Reversal
of the Examiner's rejection is requested.

CONCLUSION

At best, the prior art references show components in bits and pieces of
the inventive arrangement as claimed in the independent claims. The relevant art
recognizes many components and concepts within its domain. Upon close
investigation and scrutiny of the diverse practices in this art and its peripheral
technical fields of endeavor, a fact-finder is inevitably led to the conclusion that
artisans can and could produce a myriad of devices and functions of apparently
endless diversity from components and concepts already individually recognized as
belonging to the prior art. Such speculation must not cloud the standards for the
evaluation of patentability over the prior art under 35 U.S.C. §§ 102 and 103.
Properly focused, the issues center on what would have been anticipated, or obvious
to one of ordinary skill in the art at the time of the invention. Obviousness is tested
by what the combined teaching of the references would have suggested to those of
ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 425, 208 U.S.P.Q. 871, 881
(CCPA 1981). But it cannot be established by combining the teachings of the prior
art to produce the claimed invention, absent some teaching or suggestion supporting
the combination. See *ACS Hosp. Sys. Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577,
221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). And teachings of references can be
combined only if there is some suggestion or incentive to do so. See *In re Fine*, 837

F.2d 1071, 5 U.S.P.Q.2d 1596, 1599 (Fed. Cir. 1988). Approaches to obviousness
determinations which focus merely on identifying and tabulating missing elements in
hindsight retrospect imbue one of ordinary skill in the art with knowledge of the
invention in suit, when no prior art reference or references of record convey or
suggest that knowledge, and, fall victim to the insidious effect of hindsight syndrome
wherein that which only the inventor taught is used against its teacher. *W. L. Gore &
Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 U.S.P.Q. 312-3 (Fed. Cir. 1983).
One cannot use hindsight reconstruction to pick and choose among isolated
disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 5
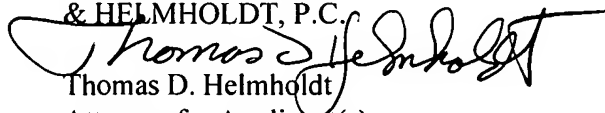U.S.P.Q.2d at 1600.

For the reasons stated above, it is respectfully submitted that
Appellants' invention as set forth in claims 1-12, 14, 16-28, 30, 32-39, and 41-48
patentably define over the cited references and is not suggested or rendered obvious
thereby. As such, it is respectfully submitted that the Examiner's final rejection of
claims 1-12, 14, 16-28, 30, 32-39, and 41-48 is erroneously based and its reversal is
respectfully requested.

No oral hearing is requested.

Appellants' attorney's previously paid the amount of $250.00 to cover
the Appeal Brief filing fee. Please charge any deficiencies to Applicants' Deposit
Account No. 25-0115.

Respectfully submitted,

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APPENDIX INDEX

LISTING OF CLAIMS ON APPEAL APPENDIX

1. An apparatus for controlling an impact/pulse tool during a fastener tightening cycle comprising:

an inlet port for receiving a supply of pressurized fluid;

a fluid pressure regulator for maintaining a selectable pressure value to be delivered to the tool to be controlled;

a sensor for measuring a characteristic corresponding to flow of the fluid to the tool to be controlled and for generating an output signal; and

a central processing unit for receiving the output signal from the sensor and for validating a fastener tightening cycle process based solely on a monitored signature of fluid flow versus time in accordance with a program stored in memory to control flow of fluid to the tool to be controlled.

2. The apparatus of claim 1, wherein the program further comprises a setup process for each fastener tightening cycle to be learned.

3. The apparatus of claim 2, wherein the setup process further comprises:

a transducer connectible between the tool to be controlled and the fastener to be tightened for generating a torque signal during a ramped pressure fastener tightening cycle; and

the central processing unit for receiving the torque signal from the transducer during the ramped pressure fastener tightening cycle, and for setting a fixed pressure value based on the received torque signal.

4. The apparatus of claim 2, wherein the setup process further comprises:

the central processing unit for receiving a torque value input by an operator using a manual torque wrench during a preset pressure fastener tightening cycle, and for setting a fixed pressure value based on the torque value input.

5. The apparatus of claim 2, wherein the setup process further comprises:

a transducer connectible between the tool to be controlled and the fastener to be tightened for generating a torque signal during the fastener tightening cycle at a fixed pressure value; and

the central processing unit for receiving the torque signal from the transducer during the fastener tightening cycle at a fixed pressure value, and for setting a fluid flow signature based on the output signal received from the sensor and the received torque signal.

6. The apparatus of claim 2, wherein the setup process further comprises:

the central processing unit for receiving the output signal from the sensor during a free air run process, and for setting a threshold value based on the received output signal.

7. The apparatus of claim 2, wherein the setup process further comprises:

the central processing unit for receiving the output signal from the sensor during a tightened fastener rehit cycle, and for setting a threshold value based on the received output signal.

8. The apparatus of claim 2, wherein the program further comprises a control program for each fastener tightening cycle to be performed.

9. The apparatus of claim 8, wherein the control program further comprises:

the central processing unit for receiving the output signal from the sensor during the fastener tightening cycle, and for comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle for controlling fluid flow to the tool to be controlled.

10. The apparatus of claim 1, wherein the program further comprises an error proofing program for each fastener tightening cycle to be performed.

11. The apparatus of claim 10, wherein the error proofing program further comprises:

the central processing unit for receiving the output signal from the sensor during the fastener tightening cycle, and for comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle for generating error proofing signals for the fastener tightening cycle based on the received output signal.

12. The apparatus of claim 1 further comprising:

an output port for supplying controlled fluid flow to the tool to be controlled through a standard fluid flow supply hose.

14. The apparatus of claim 1, wherein the pressurized fluid is compressed air.

16. The apparatus of claim 1 further comprising:

a transducer connectible between the tool to be controlled and the

fastener to be tightened and operably connectible to the central processing unit for

running a setup process for a fastener tightening cycle to be learned.

17. A method for controlling an impact/pulse tool during a fastener

tightening cycle comprising the steps of:

receiving a supply of pressurized fluid through an inlet port;

maintaining a selectable pressure value to be delivered to the tool to be

controlled with a fluid pressure regulator;

measuring a characteristic corresponding to flow of the fluid to the tool

to be controlled with a sensor and generating an output signal; and

receiving the output signal from the sensor with a central processing

unit and validating a fastener tightening cycle process based solely on a monitored

signature of fluid flow versus time in accordance with a program stored in memory to

control flow of fluid to the tool to be controlled.

18. The method of claim 17, wherein the program further comprises

the step of running a setup process for each fastener tightening cycle to be learned.

19. The method of claim 18, wherein the setup process further

comprises the steps of:

connecting a transducer between the tool to be controlled and the

fastener to be tightened;

generating a torque signal during a ramped pressure fastener tightening

cycle;

receiving the torque signal from the transducer with the central

processing unit during the ramped pressure fastener tightening cycle; and

setting a fixed pressure value based on the received torque signal.

20. The method of claim 18, wherein the setup process further comprises the steps of:

receiving a torque value input by an operator using a manual torque wrench with the central processing unit during a preset pressure fastener tightening cycle; and

setting a fixed pressure value based on the torque value input.

21. The method of claim 18, wherein the setup process further comprises the steps of:

connecting a transducer between the tool to be controlled and the fastener to be tightened;

generating a torque signal during the fastener tightening cycle at a fixed pressure value; and

receiving the torque signal from the transducer with the central processing unit during the fastener tightening cycle at a fixed pressure value; and

setting a fluid flow signature based on the output signal received from the sensor and the received torque signal.

22. The method of claim 18, wherein the setup process further comprises the steps of:

receiving the output signal from the sensor during a free air run process with the central processing unit; and

setting a threshold value based on the received output signal.

23. The method of claim 18, wherein the setup process further comprises the steps of:

receiving the output signal from the sensor during a tightened fastener rehit cycle with the central processing unit; and

setting a threshold value based on the received output signal.

24. The method of claim 18, wherein the program further comprises the step of running a control program for each fastener tightening cycle to be performed.

25. The method of claim 24, wherein the control program further comprises the steps of:

     receiving the output signal from the sensor during the fastener tightening cycle with the central processing unit;

     comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle; and

     controlling fluid flow to the tool to be controlled based on results of the comparing step.

26. The method of claim 17, wherein the program further comprises the step of running an error proofing program for each fastener tightening cycle to be performed.

27. The method of claim 26, wherein the error proofing program further comprises the steps of:

     receiving the output signal from the sensor during the fastener tightening cycle with the central processing unit;

     comparing the output signal with bench marks stored in memory based on a previous fluid flow signature of an acceptable fastener tightening cycle; and

     generating error proofing signals for the fastener tightening cycle based on the received output signal.

28. The method of claim 17 further comprising the step of:

     supplying controlled fluid flow to the tool to be controlled through an output port and a standard fluid flow supply hose.

30. The method of claim 17, wherein the pressurized fluid is compressed air.

32. The method of claim 17 further comprising the step of:

operably connecting a transducer between the tool to be controlled and the fastener to be tightened; and

operably connecting an torque signal from the transducer to the central processing unit for running a setup process for a fastener tightening cycle to be learned.

33. An apparatus for controlling an impact/pulse tool during a fastener tightening cycle comprising:

a port connectible to a supply of pressure regulated fluid;

a sensor for sensing a characteristic corresponding to flow of fluid to the tool to be controlled and for generating an output signal; and

a central processing unit for processing the received output signal from the sensor to validate a fastener tightening cycle process and control flow of fluid to the tool to be controlled without reference to an actual amount of torque applied to the fastener.

34. An apparatus for controlling an impact/pulse tool during a fastener tightening cycle comprising:

a port connectible to a supply of pressurized fluid regulated to a constant pressure;

means for monitoring a characteristic corresponding to flow of fluid to the tool to be controlled at the regulated constant fluid pressure; and

means for analyzing the monitored characteristic to determine fastener tightening cycle process validity without reference to an actual amount of torque applied to the fastener.

35. The apparatus of claim 34, wherein the processing means further comprises means for comparing the monitored characteristic as a monitored fluid flow signature versus time to an acceptable fluid flow signature versus time.

36. The apparatus of claim 34, wherein the characteristic corresponding to flow of fluid is at least one of differential pressure and acoustic data.

37. In an apparatus for controlling an impact/pulse tool during a fastener tightening cycle, the tool connectible to a supply of fluid regulated to a constant pressure, the improvement comprising:

means for monitoring a characteristic corresponding to a fluid flow signature over a predetermined period of time for fluid supplied to the tool to be controlled; and

means for determining tool process validity based solely on the monitored fluid flow signature versus time.

38. The apparatus of claim 37, wherein the determining means further comprises means for comparing the monitored fluid flow signature versus time to an acceptable fluid flow signature versus time to determine tool process validity.

39. The apparatus of claim 37, wherein the characteristic corresponding to fluid flow signature is at least one of differential pressure and acoustic data.

41. The apparatus of claim 1, wherein the characteristic corresponding to flow is at least one of differential pressure and acoustic data.

42. The apparatus of claim 1, wherein the central processing unit determines whether a fastener tightening cycle process is one of a valid process cycle and an invalid process cycle.

43. The apparatus of claim 42, wherein if an invalid process cycle occurs, the central processing unit determines whether the fastener tightening cycle process is invalid as a result of one of a rehit fastener cycle, a slipping fastener cycle, and an early trigger release fastener cycle.

44. The method of claim 17, wherein the characteristic corresponding to flow is at least one of differential pressure and acoustic data.

45. The method of claim 17, wherein the central processing unit determining step further comprises the step of determining whether a fastener tightening cycle process is one of a valid process cycle and an invalid process cycle.

46. The method of claim 45, wherein if an invalid process cycle occurs, the central processing unit determining step further comprises the step of determining whether the fastener tightening cycle process is invalid as a result of one of a rehit fastener cycle, a slipping/stripping fastener cycle, and an early trigger release fastener cycle.

47. The apparatus of claim 33 further comprising:

the central processing unit validating a fastener tightening cycle process based solely on a monitored signature of fluid flow versus time.

48. The apparatus of claim 34 further comprising:

the analyzing means to determine fastener tightening cycle process validity based solely on a monitored signature of fluid flow versus time.

EVIDENCE APPENDIX

Our Reference: SXS-100-B

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Mark W. Lehnert & Paul Podsobinski

Serial Number: 10/658,301

Filing Date: September 9, 2003

Examiner/Art Group Unit: Chukwurah, Nathaniel C./3721

Title: CONTROL SYSTEM FOR

DISCONTINUOUS POWER DRIVE

DECLARATION UNDER 37 C.F.R.. §1.132

Mail Stop:

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

I, Mark W. Lehnert, do hereby declare that:

(1) The 5,592,396 patent (hereinafter '396) uses airflow to map the fastening event using an apparatus similar to the present invention. However, the device of the '396 reference does not use the flow signature for control but rather as a trigger signal to start counting either the onset of a snug point or the proper starting point based on attaining a sufficient amplitude of pulses from an impact type power tool. In addition, in an impact wrench, the pulsed nature of the flow signal during the tightening of hammering, allows the blows, impacts to be easily counted for monitoring or control purposes. Further, the '396 patent discloses, determining whether the minimum and maximum rates of change of the fluid flow rate during tightening are within predetermined values and then, statistically processing the parameter computed during subsequent tightenings to identify trends or deviations from the normal conditions, and notifying an operator of such trends or deviations.

(2) The process for setting up the '396 system requires significant

operator input and decision-making or, in the alternative, a considerable amount of data collection is required for the computer to properly develop the limits through calculations. A series of "normal" tightenings, preferably at least 25, may be performed and the results recorded manually or transferred automatically to the computer 56 (or computer 52). By statistically evaluating these results in computer 56 (or computer 52), useful limits may then be set in computer 52. These limits may then be used for trapping (identifying) trends or deviations from learned normal conditions. This is a significant deviation both in process and in intent from the present invention. The present invention uses only one normal tightening cycle (LEARN Curve) to become fully set-up and functional.

(3) While the '396 patent describes the use of the device with direct drive (geared continuously driven) tools, the disclosure for controlling a pulse/impact type tool is for a control method that counts the number of pulses (once the amplitude level exceeds a predetermined level) to start counting and controlling the number the pulses and then calculating the area under each pulse to determine the total energy of the controlled number of pulses via a mathematically derived equivalent torque value. Means is provided for electrically processing the signal to count the number of blows delivered by the wrench. Means is provided to shut-off the fluid supply to the tool when a predetermined number of blows have been delivered, and means is provided for displaying the number of blows counted. Attempts at qualifying the event is claimed to be accomplished by mathematically comparing the summation of the total area represented by the pulses to preprogrammed high and low torque limits to determine acceptance based on the torque limits. Additionally, disclosure in the '396 patent is made that provides for trending and alarming the operator of trending based on the last two displayed fastening cycles.

(4) Extensive use of the flow signal gradient is disclosed in the '396 patent to determine such information as joint rate, joint configuration, lubrication and other varying conditions on which the system will report in an attempt to provide an indication of error detection. In the preferred embodiment of the '396 patent a

number of parameters are derived to help select the appropriate portion of the flow time curve over which to measure the flow gradient during the active phase of the tightening process. These levels are expressed as a percentage of the previously described mean speed level. The mean gradient is measured between the two points. This is a significant departure from the use of the flow/time relationship as employed in the present invention.

(5) The present invention is based on reaching equilibrium in the threaded fastener/joint/tool system at the desired torque level. The present invention is one of a prescribed process whereby the operator uses a closed loop control method including a rotary torque transducer to automatically teach (LEARN TgTq) the system the proper pressure setting for the individual tool being used through a gradual and controlled ramping of the air pressure while monitoring the applied torque to reach a condition of equilibrium in the tool/joint at the desired torque level. An actual run-down is then performed on the application (LEARN Curve) using the rotary torque transducer to determine the requisite run time required to attain equilibrium in the joint/tool system. This step is performed at the controlled pressure level as determined in the previous step and is controlled/determined by monitoring the signal from the transducer and stopping the airflow via a closed loop system. The actual control during the normal run cycle is by monitoring the flow drop off until it levels off (knee-over) and then timing the delivery of the controlled air pressure as predetermined in the Learn Curve step of the set-up routine to attain a condition of equilibrium in the system.

(6) The 5,689,434 patent (hereinafter '434) is essentially the same as 5,592,396 above. What is claimed is means for counting fluid flow peaks corresponding to individual impacts of the wrench and, further comprises means for calculating the torque applied by the wrench during tightening by counting fluid flow peaks corresponding to individual impacts of the wrench. Again, the primary differences between our invention is one of not counting the blows or pulses for control nor does the present invention attempt to calculate and display the torque from the data collected during these pulses.

(7) The '396 and '434 patent references attempt to compensate for temperature changes and viscosity in the tool in an attempt to calculate and obtain a desired final torque value when the tool is running either in a "cold" condition or in a "hot" condition. The '396 and '434 patent references look at the energy delivered to the tool on the basis of a calculated area under the curve during "impacts" of the impact wrench. In contrast, the present invention does not provide any information regarding torque applied by the tool and in fact the "impacts" are filtered out of the signal in the present invention. The present invention is directed to process control, rather than torque control as disclosed in the '396 and/or '434 patent references. The '396 and 434 patent references attempt to correlate counting impacts and calculating area (energy) under the curve to the amount of torque applied to the fastener. Ultimately, this correlation proved impossible to accomplish in a commercial product, and no devices were ever commercially sold based on the '396 and/or '434 patents.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

By: _____

Date: _3.08.05_____

RELATED PROCEEDINGS APPENDIX

NONE